



SMART MATERIALS TECHNOLOGY HAS DUAL- USE APPLICATIONS



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Payoff

The smart materials technology, developed to increase the fatigue life of vertical tails on fighter aircraft by suppressing large structural vibrations, can be generalized to eliminate other aircraft and non-aircraft structural dynamic problems. Its many commercial applications, which include a new “smart ski” developed by the K2 Corporation and Active Control eXperts, Incorporated, demonstrates its broad dual use applicability.

Accomplishment

Under a Phase I Small Business Innovation Research (SBIR) program sponsored by the Aeronautical Systems Center and technically directed by the Air Vehicles Directorate’s Structures Division, Active Control eXperts, ACX Incorporated, produced an analytical model of a buffet load alleviation (BLA) control system for twin vertical tail fighter aircraft (such as, the F-15, F/A-18 and F-22). During this Phase I activity, ACX established the suitability of their “QuickPack”, an off-the-shelf piezoelectric strain actuator product, to counteract the moments induced by buffet loads. Since these actuators can be applied to many different structural materials and surface shapes while maintaining electric isolation from the structure, their application as vibration suppression devices has been transferred to the automotive, entertainment and sporting equipment industries.

Background

The Phase I SBIR program with ACX was initiated in August 1993 to develop a BLA control system for twin vertical tail fighter aircraft. The system they developed uses smart materials to alleviate structural fatigue induced by buffet loads that are generated when such aircraft maneuver at high angles of attack. Smart materials are incorporated into smart structures (i.e., structures that sense their operating environments, process the resulting information and deform or deflect the structure based on that information and the intended mission). ACX determined that the most effective BLA system requires a combination of both passive and active suppression technologies. They employed piezoelectric strain actuators in their BLA system design because they provide both passive and active damping to vibrating structures. The actuators can be used as either passive dampers, active actuators, and dynamic sensors, or all three at the same time. In addition to incorporating these piezoelectric strain actuators into vibration isolation systems for NASA Dryden flight research equipment, ACX has commercialized their QuickPack product and transferred it to the private sector.